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**JAPANESE PATENT NO. 2002-121362  
FLAME RETARDANT POLYESTER RESIN COMPOSITION**

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(57) Abstract  
Task

To provide resin compositions that produce a flame retardant synthetic resin film or sheet having transparency, excellent flexibility, and easy handlability, by using a raw material other than a vinyl chloride resin and using no halogen flame retardant.

#### Means for solution

Flame retardant polyester resin composition obtained by adding 5-50 parts by weight of an aromatic ring-containing condensed phosphate ester and 5-50 parts by weight of an acetylated glyceride to 100 parts by weight of a polyester resin.

#### Claim

Flame retardant polyester resin composition obtained by adding 5-50 parts by weight of an aromatic ring-containing condensed phosphate ester and 5-50 parts by weight of an acetylated glyceride to 100 parts by weight of a polyester resin.

#### Detailed explanation of the invention

[0001]

#### Technological field of the invention

The present invention concerns flame retardant polyester resin compositions, and more specifically concerns soft, transparent flame retardant polyester resin compositions suitable for fabricating into sheets and films (hereafter referred to as film-sheet), especially partition sheets.

[0002]

#### Conventional technology

Conventionally, for curtains used for partitioning in plants, soft, transparent, a flame retardant synthetic resin film-sheet has been used. For a synthetic resin sheet-film satisfying such requirements, a soft vinyl chloride resin film-sheet has been used. However, in the waste treatment of such materials, acidic gases are generated upon incineration, which are not favorable to the global environment.

[0003]

Therefore, developments and investigations have been under way to obtain a flame retardant synthetic resin film-sheet for the replacement of vinyl chloride resins. As a result, a flame retardant olefin resin film-sheet has been produced as a replacement for vinyl chloride resins. However, obtaining both transparency and softness has been difficult.

[0004]

It has been known that flame retardation can be achieved by adding halogen-based flame retardants. However, they cause the problem of generating acidic gases during incineration.

[0005]

Problems to be solved by the invention

It is a task of the present invention to provide resin compositions that produce a flame retardant synthetic resin film-sheet having transparency, excellent flexibility, and easy handlability, by using a raw material other than a vinyl chloride resin and using no halogen flame retardant.

[0006]

Means for solving the problems

For solving such problems, the present invention concerns flame retardant polyester resin compositions obtained by adding 5-50 parts by weight of an aromatic ring-containing condensed phosphate ester and 5-50 parts by weight of an acetylated glyceride to 100 parts by weight of a polyester resin.

[0007]

Namely, in the present invention, polyester resins are selected as materials for replacing vinyl chloride resins, and aromatic-ring-containing condensed phosphate esters are added as phosphate ester flame retardants, together with acetylated glycerides. With such compositions, the resin compositions of the present invention can be molded into a film-sheet having excellent transparency and with good softness.

[0008]

Practical embodiments of the invention

The polyester resins that can be used for obtaining resin compositions of the present invention may be polyethylene terephthalate (PET), polybutylene terephthalate (PBT), polycyclohexane terephthalate (PCT), terephthalic acid-ethylene glycol-1,4-cyclohexanedimethanol copolymer (PET-G), etc., while copolymers of isophthalic acid, neopentyl glycol, cyclohexanediol, etc., can also be used.

[0009]

There are no specific restrictions on the types of aromatic-ring-containing condensed phosphate esters added as flame retardants to the polyester resins used in the present invention, while they are preferably condensed phosphate esters having a melting point of 80-250°C in terms of heat resistance, processability, or water resistance.

[0010]

In the flame retardant polyester resin compositions of the present invention, the amount of aromatic-ring-containing condensed phosphate ester added should be 5-50 parts by weight, preferably 10-30 parts by weight, in relation to 100 parts by weight of the polyester resin. Below 5 parts by weight, flame retardation is not sufficient, while

above 50 parts by weight, the film-sheet would have reduced mechanical strength, with no added benefit commensurate to the added cost.

[0011]

On the other hand, the amount of acetylated glycerides added together with the aromatic-ring-containing condensed phosphate esters should be 5-50 parts by weight, preferably 20-40 parts by weight, in relation to 100 parts by weight of the polyester resin. Below 5 parts by weight, the film-sheet would not have the desired softness, while above 50 parts by weight, processing becomes difficult and blocking occurs among the molded product, making handling difficult.

[0012]

The acetylated glycerides used in the present invention are glycerin, one or two OH groups of which are esterified with a fatty acid, with at least one of the remaining OH groups being acetylated (esterified with acetic acid). The fatty acids that are esterified with glycerin may be stearic acid, palmitic acid, oleic acid, linoleic acid, etc.

[0013]

If needed, various additives such as lubricants, antioxidants, antistatic agents, UV absorbers, light stabilizers, reinforcements, pigments, inorganic/organic fillers, etc., may be added to the resin compositions of the present invention. There are no specific restrictions on the type and added amount of such additives; additives commonly used for polyester resins may be added in amounts as needed.

[0014]

The flame retardant polyester resin compositions of the present invention are especially suitable for sheets for partition curtains in plants, film products, etc. For obtaining such molded products, the resin compositions of the present invention are melt-kneaded in a binder mixer, twin-screw extruder, kneader-extruder, roll, etc., then calender molded or T-die extrusion molded to obtain a film-sheet with the desired thickness. A universal thickness cannot be defined for molded products, and it may vary according to the application purpose of the film-sheet, e.g., about 0.01-1 mm in the case of a plant partition curtain.

[0015]

#### Examples

Next, the present invention is explained in further detail with examples. However, the present invention is not limited to such examples, and various modifications are also included in the present invention.

[0016]

Application Examples 1-5, Comparative Examples 1-3

The polyester resin and flame retardants shown in Table 1 were kneaded together and formed into a 200- $\mu$ m-thick film by two 8-inch rolls. The resin composition of Comparative Example 1 contained only the aromatic-ring-containing condensed phosphate ester as the flame retardant, while the resin composition of Comparative Example 2 contained only an acetylated glyceride as the flame retardant and the resin composition of Comparative Example 3 contained an acetylated glyceride and ammonium phosphate as the flame retardant.

[0017]

The films obtained were tested for transparency, softness, and flame retardance. The results are shown in the table.

[0018]

Table 1

	Application Example					Comparative Example		
	1	2	3	4	5	1	2	3
PET-G *1	100	100	100	100	100	100	100	100
Condensed phosphate ester *2	20	30	10	45	10	30	30	—
Acetylated monoglyceride *3	30	10	40	45	10	—	—	30
Ammonium polyphosphate *4	—	—	—	—	—	—	—	30
Transparency *5	○	○	○	○	○	○	○	×
Softness *6	○	○	○	○	△	×	×	○
Flame retardance *7	○	○	○	○	○	○	○	○

[0019]

\*1 Eastar PETG 6763 (product of Eastman Chemical Co.)

\*2 PX200 (product of Daihachi Chemical Industry Co.)

\*3 PL012 (product of Riken Vitamin Co.)

\*4 Terraju C60 (product of Chisso Co.)

[0020]

\*5 Transparency evaluation by visual observation

○: transparent

×: not transparent

[0021]

\*6 Softness evaluation by touching

○: soft

△: semi-rigid

×: rigid

[0022]

\*7 Flame retardance evaluation according to Fire Prevention Law 4-3 using the 45° microburner method.

○: pass

×: did not pass

[0023]

As clearly shown by the results in the table, compared with films of the comparative examples, the films made from the resin compositions of the present invention have good transparency, softness, and flame retardance.

[0024]

Effects of the invention

The flame retardant polyester resin compositions provided by the present invention are soft, have excellent flame retardance, and are suitable for films and sheets with excellent transparency. Furthermore, the flame retardant resin compositions of the present invention are suitable for making plant partition curtains and sheets requiring flame retardance, transparency, and softness, and especially for replacing vinyl chloride resin compositions, and are especially excellent in terms of global environmental protection in waste disposal treatment.